

6792335 ONEIDA ELECTRONIC MFG INC

58C 00300 DT-11-25

#4



## Z-MOV Transient Voltage Suppressors

Data Sheet No. O-101



File # E71220

Zenamic®

# Z7, Z10, Z15, Z21, & Z33 SERIES



### Description/Features

Z-MOV Zenamic Metal Oxide Varistors are Transient Voltage Suppressors having a non-linear current-voltage characteristic which sustains an almost constant voltage over a wide range of current. They are ideally suited to all transient voltage protection applications and their high clamping efficiency and low steady state power dissipation offer considerable circuit advantages over most existing methods of protection.

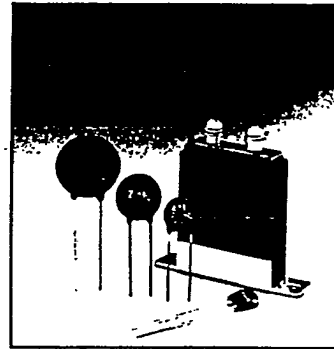
During operation, the Zenamic lides at a low current level at the nominal voltage. When a transient over voltage occurs, Zenamic current increases rapidly, its voltage remaining virtually constant, and the transient energy content is thus absorbed.

#### FEATURES

- High surge current capability
- Excellent voltage clamping characteristic
- Symmetrical characteristic — use on AC or DC
- Instantaneous response
- Compact and robust
- Low idling current

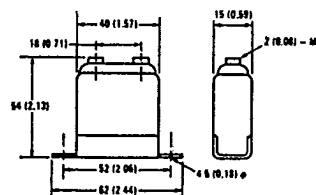
#### APPLICATIONS

- Protection of all types of semiconductors
- Absorption of surges associated with lightning
- Suppression of switching surges
- Protection in inductive switching circuits
- Prolongation of contact life
- Voltage clipping



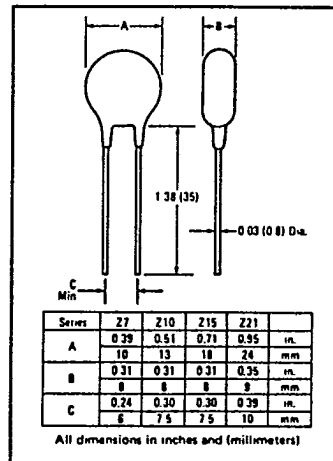
### Major Ratings and Characteristics

		Z7	Z10	Z15	Z21	Z33	Units
Voltage Range	AC	12-600	17-600	20-600	25-600	130-600	V
	DC	15-810	23-810	27-810	33-810	170-810	V
Energy		3-24	18-60	30-90	33-80	150-300	J
Operating and Storage Temperature Range		-20 to 110					°C



Z33

Outer dimensions of M type



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**ZENAMIC SELECTION PROCEDURE:**

- 1) Choose the AC or DC voltage rating, from columns 2 or 3 to be equal or marginally greater than the maximum steady state circuit value.
- 2) Calculate or estimate the maximum transient energy possible in the circuit. For example, a transient produced by switching a transformer will have an energy content of  $\frac{1}{2}LI^2$ , where L is the transformer leakage inductance and I is the peak current flowing through the winding.
- 3) Ensure that I peak, from column 6, will not be exceeded for the selected zenamic.
- 4) The chosen zenamic can now be assessed from fig. 3 for its voltage clamping characteristic at a specified current.

**ELECTRICAL CHARACTERISTICS**

Part Number	Applied Voltage		Max. Operating Conditions			Peak Voltage (Clamping) @ 1 mA (V <sub>I</sub> )		① Clamping Ratio ±20%		Capacitance Reference Value (pF)
	AC (RMS) Max. (V)	DC (V)	PAV (W) ①	Energy Joules @ 10 ms ①	I <sub>peak</sub> Surge Current Capacity 8 x 20 μsec. (A) (nonrepetitive)	Min. (V)	Max. (V)	At Amps		
0Z7L220	12	15	0.03	3	200	18	25	2.20	10	4200
0Z7L270	14	19	0.03	3	200	23	31	2.20	10	3300
0Z7L330	17	23	0.03	3	200	28	38	2.20	10	2700
0Z7L390	20	27	0.03	6	200	33	45	2.20	10	2200
0Z7L470	25	33	0.03	3	200	39	54	1.83	10	1400
0Z7L560	30	40	0.03	3	200	47	64	1.83	10	1100
0Z7L680	36	48	0.03	3	200	57	78	1.83	10	870
0Z7L820	44	58	0.03	6	200	69	94	1.83	10	700
0Z7L101	54	72	0.03	6	200	85	115	1.83	10	520
0Z7L121	65	72	0.03	6	200	102	138	1.83	10	420
0Z7L151	90	120	0.2	3	500	135	165	2.00	100	410
0Z7L181	110	140	0.2	6	500	162	198	2.00	100	350
0Z7L201	120	160	0.2	6	500	180	220	1.83	100	320
0Z7L221	130	170	0.2	6	500	198	242	1.83	100	300
0Z7L271	160	210	0.2	6	500	243	297	1.83	100	250
0Z7L331	200	260	0.2	6	500	297	363	1.83	100	210
0Z7L391	230	310	0.2	12	500	351	429	1.83	100	180
0Z7L441	260	350	0.2	12	500	396	484	1.83	100	160
0Z7L471	280	380	0.2	12	500	423	517	1.83	100	150
0Z7L561	340	450	0.2	12	500	504	616	1.83	100	140
0Z7L681	410	550	0.2	12	500	612	748	1.83	100	110
0Z7L821	490	660	0.2	24	500	738	902	1.75	100	96
0Z7L102	600	810	0.2	24	500	900	1100	1.75	100	86
0Z10L330	17	23	0.06	18	500	28	38	2.20	10	4600
0Z10L390	20	27	0.06	24	500	33	45	2.20	10	3800
0Z10L470	25	33	0.06	18	500	39	54	1.83	10	2400
0Z10L560	30	40	0.06	18	500	47	64	1.83	10	1900
0Z10L680	36	48	0.06	18	500	57	78	1.83	10	1500
0Z10L820	44	58	0.06	24	500	69	94	1.83	10	1200
0Z10L101	54	72	0.06	24	500	85	115	1.83	10	900
0Z10L121	65	86	0.06	24	500	102	138	1.83	10	720
0Z10L151	90	120	0.4	18	1000	135	165	1.83	100	700
0Z10L181	110	140	0.4	24	1000	162	198	1.83	100	600
0Z10L201	120	160	0.4	24	1000	180	220	1.75	100	550
0Z10L221	130	170	0.4	30	1000	198	242	1.75	100	520
0Z10L271	160	210	0.4	30	1000	243	297	1.75	100	440
0Z10L331	200	260	0.4	36	1000	297	363	1.75	100	370
0Z10L391	230	310	0.4	45	1000	351	429	1.75	100	330
0Z10L441	260	350	0.4	45	1000	396	484	1.75	100	310
0Z10L471	280	380	0.4	45	1000	423	517	1.75	100	280
0Z10L561	340	450	0.4	45	1000	504	616	1.75	100	250
0Z10L681	410	550	0.4	45	1000	612	748	1.75	100	220
0Z10L821	490	660	0.4	60	1000	738	902	1.65	100	190
0Z10L102	600	810	0.4	60	1000	900	1100	1.65	100	170

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## ELECTRICAL CHARACTERISTICS (Continued)

Part Number	Applied Voltage		Max. Operating Conditions			Peak Voltage (Clamping) @ 1 mA (V <sub>I</sub> )		① Clamping Ratio ±20%	Capacitance Reference Value (pF)
	AC (RMS) Max. (V)	DC (V)	PAV (W) ①	Energy Joules @ 10 ms ①	Peak Surge Current Capacity 8 x 20 μsec. (A) (nonrepetitive)	Min. (V)	Max. (V)		
0215L390	20	27	0.1	30	1000	33	45	2.20	8000
0215L470	25	33	0.1	24	1000	39	54	1.83	5000
0215L560	30	40	0.1	24	1000	47	64	1.83	4000
0215L680	36	48	0.1	24	1000	57	78	1.83	3100
0215L820	44	58	0.1	30	1000	69	94	1.83	2500
0215L101	54	72	0.1	30	1000	85	115	1.83	1900
0215L121	65	86	0.1	36	1000	102	138	1.83	1500
0215L151	90	120	0.6	30	2000	135	165	1.83	1600
0215L181	110	140	0.6	36	2000	162	198	1.75	1400
0215L201	120	160	0.6	36	2000	180	220	1.67	1200
0215L221	130	170	0.6	45	2000	198	242	1.67	1100
0215L271	160	210	0.6	45	2000	243	297	1.67	970
0215L331	200	260	0.6	51	2000	297	363	1.67	820
0215L391	230	310	0.6	60	2000	351	429	1.67	700
0215L411	250	330	0.6	60	2000	373	456	1.67	660
0215L441	260	350	0.6	60	2000	396	484	1.67	640
0215L471	280	380	0.6	60	2000	423	517	1.67	600
0215L561	340	450	0.6	60	2000	504	616	1.67	520
0215L681	410	550	0.6	75	2000	612	748	1.67	440
0215L751	450	610	0.6	75	2000	675	825	1.67	400
0215L821	490	660	0.6	90	2000	738	902	1.58	380
0215L102	600	810	0.6	90	2000	900	1100	1.58	330
0221L470	25	33	0.15	33	2000	39	54	1.80	7800
0221L560	30	40	0.15	33	2000	47	64	1.80	6200
0221L680	36	48	0.15	39	2000	57	78	1.80	5000
0221L820	44	58	0.15	45	2000	69	94	1.80	4000
0221L101	54	72	0.15	45	2000	85	115	1.80	3000
0221L121	65	86	0.15	45	2000	102	138	1.80	2300
0221L151	90	120	0.8	45	4000	135	165	1.67	2300
0221L181	110	140	0.8	54	4000	162	198	1.58	2000
0221L201	120	160	0.8	54	4000	180	220	1.58	1800
0221L221	130	170	0.8	66	4000	198	242	1.58	1700
0221L271	160	210	0.8	66	4000	243	297	1.58	1400
0221L331	200	260	0.8	75	4000	297	363	1.58	1200
0221L391	230	310	0.8	90	4000	351	429	1.58	1050
0221L441	260	350	0.9	90	4000	396	484	1.58	950
0221L471	280	380	0.8	90	4000	423	517	1.58	900
0221L561	340	450	0.8	70	4000	504	616	1.58	800
0221L681	410	550	0.8	70	4000	612	748	1.58	680
0221L821	490	660	0.8	70	4000	738	902	1.58	580
0221L102	600	810	0.8	80	4000	900	1100	1.58	500
0233M221	130	170	2.4	150	20000	198	242	1.58	5000
0233M271	160	210	2.4	150	20000	243	297	1.58	4000
0233M331	200	260	2.4	180	20000	297	363	1.58	3200
0233M391	230	310	2.4	225	20000	357	429	1.58	2700
0233M441	260	350	2.4	225	20000	396	484	1.58	2400
0233M471	280	380	2.4	225	20000	423	517	1.58	2200
0233M561	340	450	2.4	255	20000	504	616	1.58	1800
0233M681	410	550	2.4	255	20000	612	748	1.58	1500
0233M821	490	660	2.4	300	20000	738	902	1.50	1200
0233M102	600	810	2.4	300	20000	900	1100	1.50	1000

① Derating above 60°C.

① Applied 1000 times.

① Ratio of voltage at specified amps to voltage at 1 mA.

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## Z7, Z10, Z15, Z21 and Z33 Series, Data Sheet No. PD-5.006A

## Reliability Test and Criteria

Test	Method												
1. I <sub>peak</sub> Maximum allowable current	V <sub>1</sub> is measured, the rated current value with the waveform of Figure 2 is applied twice in the same direction at a 2 min. interval. V <sub>1</sub> is measured 30 min. later.												
2. Surge life expectancy	V <sub>1</sub> is measured, the tabulated current with the waveform of Figure 2 is applied 10,000 times in the same direction. V <sub>1</sub> is measured 30 min. later.												
	<table><tr><th>Type</th><th>Z7 ...</th><th>Z10 ...</th><th>Z15 ...</th><th>Z21 ...</th><th>Z33 ...</th></tr><tr><th>I(peak)</th><td>25A</td><td>50A</td><td>100A</td><td>200A</td><td>500A</td></tr></table>	Type	Z7 ...	Z10 ...	Z15 ...	Z21 ...	Z33 ...	I(peak)	25A	50A	100A	200A	500A
Type	Z7 ...	Z10 ...	Z15 ...	Z21 ...	Z33 ...								
I(peak)	25A	50A	100A	200A	500A								
3. Maximum storage temperature	Measure V <sub>1</sub> at T = 25°C. Store the device at 110°C for 1000 hr., allow to cool to T = 25°C, measure V <sub>1</sub> 30 min. later.												
4. Humidity tolerance	Measure V <sub>1</sub> at T = 25°C. Store the device at 40°C in a 90-95% relative humidity and apply the rated AC voltage for 1000 hr. Allow to cool to T = 25°C, measure V <sub>1</sub> 30 min. later.												
5. Temperature cycling	Measure V <sub>1</sub> at T = 25°C. Perform 5 cycles of T = -25°C for t = 30 min.; T = 25°C for t = 15 min.; T = 85°C for t = 30 min.; T = 25°C for t = 15 min. Measure V <sub>1</sub> .												
6. Boiling water	Measure V <sub>1</sub> at T = 25°C. Perform 6 cycles of immerse in boiling water for t = 8 hr., leave under ambient conditions for t = 16 hr. Measure V <sub>1</sub> .												

The criteria for all these tests is that the change of  $V_1$  is to be less than 10%, and additionally for test 5, that the outside surface appearance should not be affected.

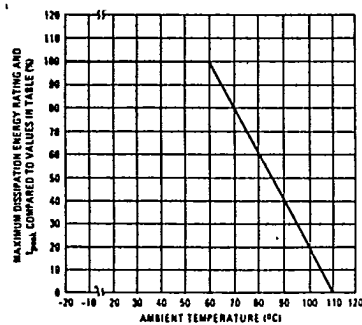


Fig. 1 - Energy Dissipation Rating Vs. Ambient Temperature

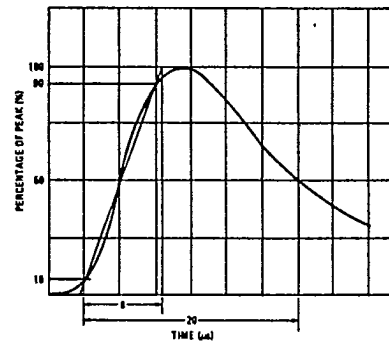


Fig. 2 - Test Current Waveform

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## Z7, Z10, Z15, Z21 and Z33 Series, Data Sheet No. PD-5.006A

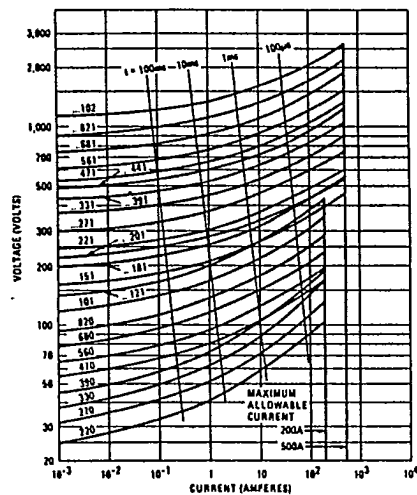


Fig. 3 - Voltage Vs. Current Characteristics, Z7L Series

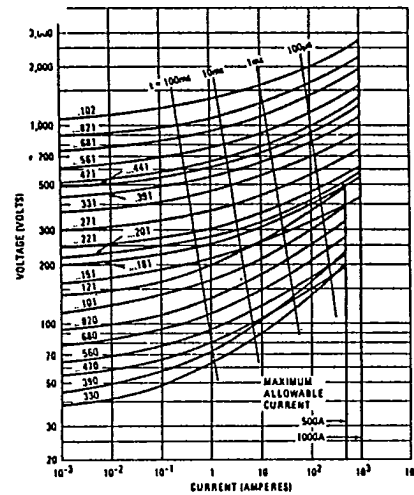


Fig. 4 - Voltage Vs. Current Characteristics, Z10L Series

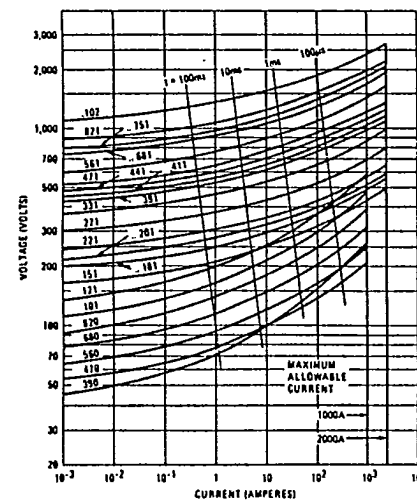


Fig. 5 - Voltage Vs. Current Characteristics, Z15L Series

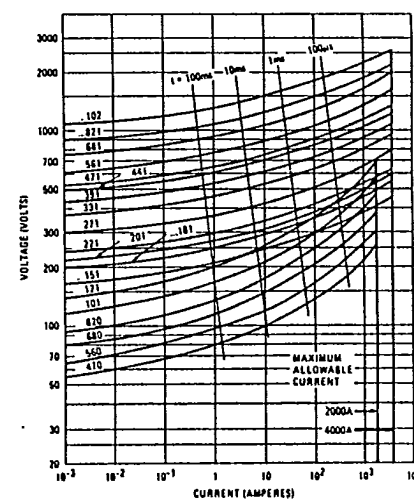


Fig. 6 - Voltage Vs. Current Characteristics, Z21L Series

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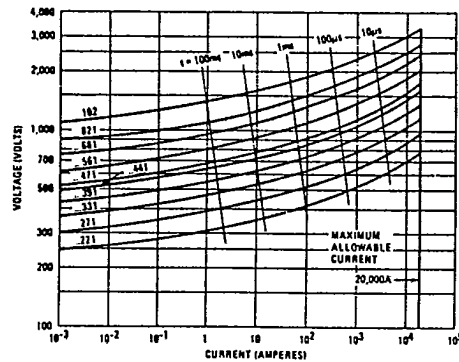


Fig. 7 - Voltage Vs. Current Characteristics, Z33L Series

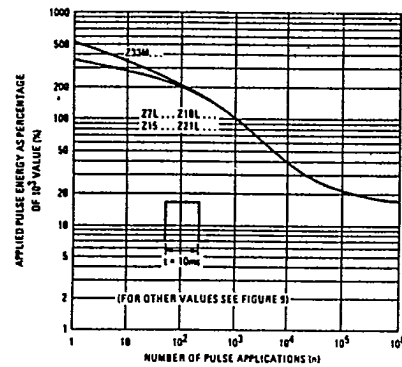


Fig. 8 - Life Expectancy Vs. Applied Pulse Energy

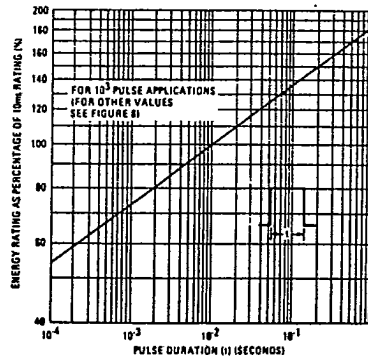


Fig. 9 - Energy Dissipation Rating Vs. Pulse Duration


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 ELECTRONIC MFG. INC.

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